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# IOT Based Coal Mine Safety Monitoring and Alerting System Using Arduino Uno

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**ABSTRACT:** Coal is the most important thing for power generation. The project is used for the applications of monitoring high temperatures, gas levels, mine explosions, fire accidents and methane gas, and so on. Still now, the safety production levels are low, so many disasters occur frequently, and loss of profession and great life. To overcome these problems, this project introduced a very useful, wireless sensor network application in the coal mine safety system. In this, the sensor is useful for detecting accidents and giving alerts to the mineworkers through the Arduino Uno. The project uses DTH 11 temperature sensor, an MQ6 gas sensor, and a water level sensor that are used to detect accidents and give alerts to the mine authorities through the Bluetooth HC-05, buzzer and LCD display devices.

**KEYWORDS:** wireless sensor technology, mine safety monitoring and alerting system, Arduino UNO, Bluetooth Module.

## I.INTRODUCTION

Mines are the most dangerous place to work because, in the mines, explosions happen and most of the workers are there. The biggest problem in coal mines, during mine explosions and drilling and blasting, harmful gases are released, such as carbon monoxide, hydrogen sulphide, methane, etc. To prevent the option is to detect their presence and necessary actions.

This project is proposed for a safety system that uses ARDUINO UNO for monitoring and alerting purposes. This is achieved by using different types of sensors, such as DTH 11 temperature sensor, mq6 gas sensor, and water level sensor, which are used for giving alerts when it detects a problem.

All the sensors are connected to the ARDUINO UNO, which collects the data and transmits it to the Bluetooth. The Bluetooth HC-05 monitors the data from the sensors and gives it to the buzzer and LCD which are used to alert the coal mine workers. The project is based on the IOT domain. Of things IOT is nothing but the objects devices communicating with each other by using the internet the main controller of the project ARDUINO UNO which is used for storing entire system program instructions with the help of ide.

The Arduino Uno is interfaced with different types of sensors, such as the DHT temperature sensor is used to measure the temperature in the range of -55c to 155c mq6, a gas sensor is used to find the presence of gases in a coal mine environment and a buzzer is an audio signal device which is used to convert audio signal to sound signal. It is widely used in alarm computer printers.

For example, when the temperature value rises above 50 degrees Celsius in a coalmine area due to fire, the sensors detect and give data to the controller to initialize the data and the buzzer indicating the presence of fire, and an LCD is used to display the ranges and a fan is used when any harmful gases are released sends exhausting fan to collect the harmful gases and send them to outside of the coal mine environment.

The study on real time monitoring of toxic gases and other parameters present in underground mines has been analysed using wireless sensor networks it will be helpful to all miners present inside the mine to save their lives before any abnormal situation occur alarm triggers when sensor value crosses the higher level this system also stores.



## II. LITERATURE SURVEY

PROF.A.H. ANSARI AND NIKAM RISHIKESH [1],IOT-based coal mine safety monitoring and alerting system. This paper describes the ZigBee technology and provides a direction. is the limitation of this paper ZigBeetechnologized use for short-range communications at the range of 10 meters And this system does not work properly in underground areas.

R.BHUVANESHSWARI and RICHARD ROY [2],Coalmine monitoring using a thing-speak cloud platform and NODEMCU. Implemented on ZIGBEE BASED MINE SAFETY MONITORING SYSTEM WITH GSM. published in the International Journal of Computer and Communication Technology,2015 This paper proposed that an s-SPEAK is an IOT platform that provides instant visualization and live data and alerts sent to coal mine areas. The limitation of this paper is that it provides only security but no prevention.

RAJKUMAR BABU and BALANAGU [3],Coalmine safety monitoring using GSM modem. In this paper the authors proposed GSM technology which is used to convey information to the coal mine authorities. The Global system for mobile communications is an open and digital cellular technology used for mobile communication. The limitation of this paper is it does not properly work in the underground areas.

ZHUO PING and CHENG BO [4],Complex Event Processing (CEP) based alarm system for coal mine safety. In this paper, the authors proposed a system based on a service-oriented architecture whose exchange mechanism is event-driven by the method of the publisher. The limitation of this paper is that it does not provide a security system and only uses an alarm system.

## III.PROPOSED SYSTEM

In this proposed system, the coal mine safety monitoring systems are interconnected with the gas sensor, temperature sensor/humidity sensor, water level sensor, fire sensor, Buzzer and LCD. We interconnected all the sensors to Arduino Uno.

In this system, we mainly have controlling and monitoring systems. monitoring system, we monitor all the information from the sensors. The temperature sensor detects the temperature level that exceeds the normal level, then the buzzer will beep the sound so that the mineworkers are notified. The gas sensor also monitors the gas values inside the coal mine. The water level sensor also exceeds the level of storage, then the motor automatically switches ON so all mineworkers get notified.

The system is done using the Bluetooth Technology.which is used to send the information to the output devices. The Arduino Uno will send each second value to theBluetooth and electrical devices upon the sensor value.

## IV.BLOCK DIAGRAM

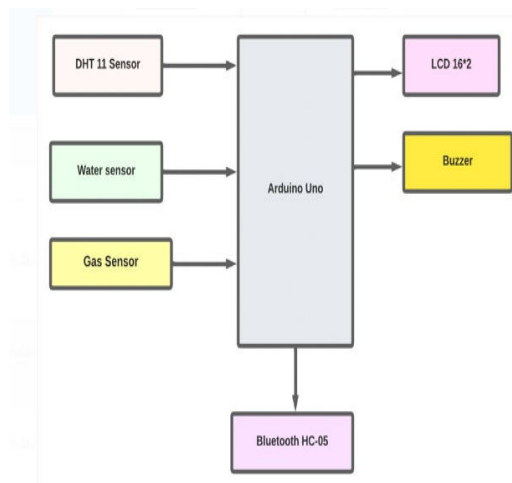


Fig 1: Block diagram of IOT Based Coal Mine Safety Monitoring and Alerting System using Arduino UNO



The block diagram of this proposed system consists of:

- 1.Arduino UNO
- 2.Bluetooth module
- 3.DTH 11 sensor
- 4.Gas sensor (MQ6)
- 5.Water sensor
- 6.LCD
- 7.Buzzer

### V.FLOWCHART

The flowchart gives a short description of how this project works. Firstly, check the DHT, gas, and water level sensors. To display those values through Bluetooth. If temperature value is greater than 40 automatically tone the buzzer and display alert through Bluetooth. If gas and water level sensor exceed the values automatically tone the buzzer and display alert through Bluetooth. any sensor is activated automatically the ARDUINO UNO is initialized. After the process, Arduino sends the data to Bluetooth and gives data to the electrical devices.

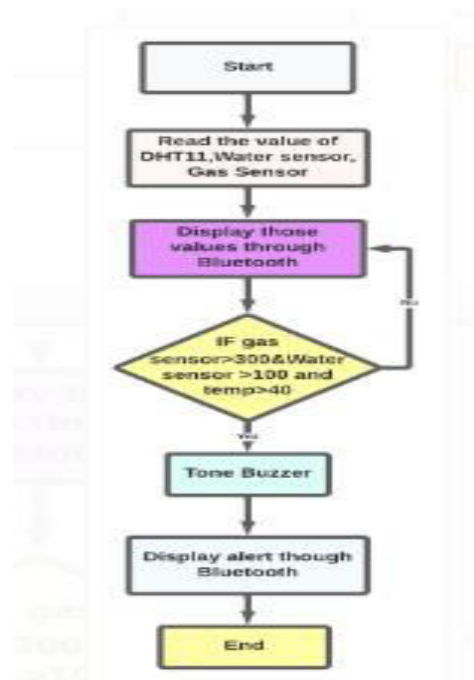


Fig 2: Flowchart of IOT Based Coal Mine Safety Monitoring and Alerting System using Arduino UNO. If any sensor state is activated automatically, the LCD will display and the buzzer will activate and give a beeping sound. The total information is sent to the control room.



## VI. RESULTS

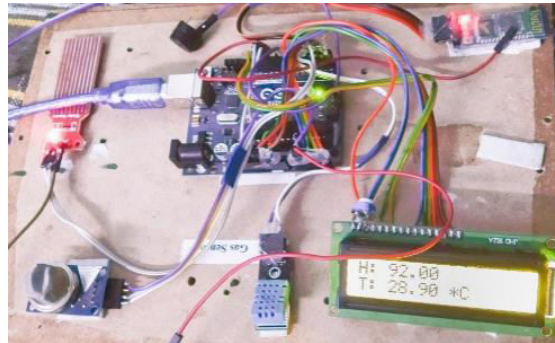


Figure 1 Hardware Implementation

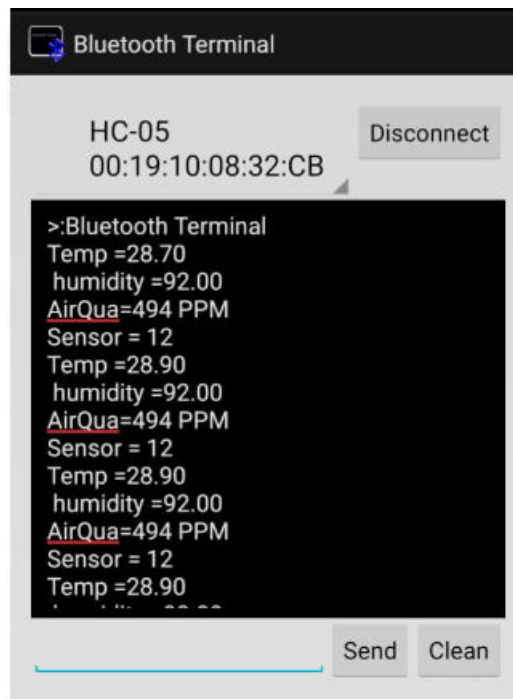


Figure 2 Bluetooth Terminal Application

## VII. CONCLUSION

Implementation of coal mine safety monitoring system is implemented by using a Temperature sensor, Gas sensor, and Fire sensor it will be helpful to all miners present inside the mine to save their life before any casualty occurs. Implementation of a coal mine safety system using gas sensors to increase the safety of the workers in the coal mine and prevent them from danger. The alarm beeps when the sensor value is above the normal value level. The system is cost-effective and efficient.

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